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by S.V. Vonsovskiy

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(Condensed translation)

The section of Physics and Mathematics of the Acad Sci USSR and the Acad Sci USSR (Inst of Physics - Problems - Construction of Legation, Acad Sci USSR) organized a conference on the subject in September 23 Nov to 2 Dec 1961. The first stage of the conference was held in 1961.

About 300 people from 10 institutions took part in the conference. 50 reports were made mostly devoted to general theoretical and experimental problems. The first section included "Basic theory of magnetism, physical properties of magnetic substances in the presence of field, non-metallic ferromagnetism". The second section was devoted to investigation of ferromagnetism, the curve of magnetization, investigation of effect of external action on magnetic properties, method of magnetic structural analysis, magnetic defectoscopy and computations.

Prof S.V. Vonsovskiy reported on "Problems of quantum theory in ferromagnetism", criticizing quasi-classical Anglo-American theories.

S.V. Tyablikov reported on "Problem of quantum theory of magnetic anisotropy" describing research conducted by himself with the help of corresponding member of Acad Sci USSR N.N. Bogolyubov.

The report by Prof. S.V. Vonsovskiy and K.B. Vlasov on "Atomic magnetic moments in ferromagnetic metals and alloys" was devoted to descriptions of results of application of a model of interacting external and internal electrons to the problem of computation of the atomic magnetic moments in ferromagnetic metals and alloys.

The report by Prof. S.V. Vonsovskiy, K.P. Rodionov and L.Ya. Kobelev: "Theory of Goldammer's phenomenon in ferromagnetics" dealt with application of the previously described model to an explanation of laws of galvanometry.

A.I. Rezanov reported on "Thermal and thermoelectric properties of ferromagnetic metals" using the model of interacting external and internal electrons to clarify thermal and thermoelectric properties of ferromagnetics near the Curie point.

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N.P. Patrashin in his report on "Theory of galvanometric and thermomagnetic phenomena in ferromagnetics" applied the theory of interacting external and internal electrons to an explanation of particular properties of these phenomena.

In a report by prof. S.V. Vonsovskiy and Ye. N. Agafonova "Theory of ferromagnetic semiconductors" they outlined the fundamentals of multiclectron theory, taking into account the polar and excited electron states.

In a report by prof. S.V. Vonsovskiy and A.V. Sokolov: "Quantum theory of the photoelectric and photoacoustic properties of ferromagnetics" they calculated these properties using the quantum-mechanical model of external and internal electrons.

Prof. B. I. Zolotarev described in his report: "Some laws of the photoacoustic properties of ferromagnetics" results of measurements of the real dependence of the photoacoustic rotation is nickel, showing the presence of such rotation even in the visible light.

Prof. Ye. I. Kondorskiy gave in his report: "Single domain structure and theory of magnetic properties of highly coercive ferromagnetics" a survey of his previous activity.

Active member of Acad. Sci. USSR N.S. Akulov and G.S. Krinchik reported on "Magnetic and mechanic properties of ferromagnetics in dynamic systems" in which they developed ideas by V.K. Arkad'yev and his school.

Prof. Ya. G. Dorfman reported on "Ferromagnetic and anti-ferromagnetic semiconductors as problem of solid state physics" presenting a review of modern conception of ferromagnetism.

A report of the acting member of the Acad. Sci. Ural SSR B. G. Lazarev, B. I. Verkin and N. S. Rudenko: "Magnetic properties of dia- and paramagnetic metals at low temperatures" was devoted to a review of basic works on magnetism at low temperatures.

In Prof. K. M. Polivenov's report: "Frequency characteristics of modern magnetic materials" some general problems of magnetodynamics, developed by V. K. Arkad'yev, were discussed.

Dr K. P. Belov reported experimental data on magnetostriction in: "Investigations of magnetoelastic phenomena in ferromagnetics in the paramagnetic range".

In the report by Prof. Ye. I. Kondorskiy and L. N. Fedorov: "Ferromagnetism of alloys at low temperatures" the importance of the subject was emphasized and experimental research results by the authors on magnetic saturation of ferro-nickel alloys in the range of Ni to H temperatures described.

I. M. Kirko's report on "Dispersion of magnetic permeability of polycrystalline ferromagnetics in the range of sound frequencies" was devoted to measurement results of frequency dependence of the complex (according to Arkad'yev) magnetic permeability of various steels and of 45% molybdenum permalloys.

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•Prof. Ya. S. Shur's report: "Magnetic structure of magneto-textured highly coercive alloys" was a review of modern conceptions of the physical nature of rigid magnetic materials.

Dr R.V. Telesnin described his research on magnetic viscosity in his report: "Some laws of magnetic viscosity".

Ye. F. Kuritsina reported her experimental research on thermal dependence of magnetic viscosity of pure iron, cobalt, ferronickel and ferrozine in her report: "Thermal dependence of magnetic viscosity".

Acting member of Acad. Sci. of Turbmenia SSR R.G. Amayev reported on "Variation of electric resistance in a longitudinal magnetic field and on ferromagnetic effect in alloys of ferro-platinum", in which he emphasized the effect of processes of progressing order in ferro-platinum alloys.

M.I. Yermola reported on his research of application of magnetic colloidal figures in the study of structure of ferromagnetic metallic alloys in: "Magnetic metallography and its application".

T.M. Dugunov, R.B. Lenina and V.V. Elyashkin described their experimental research in: "Electron-microscopic investigation of the structure of alloys alni and magniko".

Prof. Ya. S. Shur, T.D. Zolotov, V.A. Zaykova and I.A. Chebotareva presented their experimental results in: "Dependence of the coercive force on the dimensions of powder particles and on the thickness of the sheet of soft magnetic materials".

I.M. Puzey described the results of his measurements of the constant magnetic anisotropy of triple permalloy alloys in: "Energy of anisotropy of alloys of permalloy class".

N.V. Volkenshtein reported on "Study of connection between the constant of Hall-Kikoin of ferromagnetic alloys and the spontaneous magnetization", dealing with research by A.P. Komar and by the writer on Hall-Kikoin phenomena in a ferromagnetic alloy in a state of progressing order. It was revealed for the first time that Kikoin's constant is a function of spontaneous magnetization.

V.V. Parfenov and V.R. Abels exposed the results of their experimental research in: "Investigation of thermal dependence of Hall-Kikoin effect in electrolytic iron".

The report by Ya.S. Shur and T.D. Zolotov: "Investigation of phenomenon of variation of electric resistance of monocrystals of transformation steel in a magnetic field" is of importance, because monocrystals in the shape of cylindrical rods were succeeded for the first time.

Results of experimental research of magnetic, thermal and galvanomagnetic phenomena of ferromagnetic alloys of non-ferromagnetic compound were described in reports by I.G. Fakidov and N.P. Grazhdankina: "Dependence of electric resistance of ferromagnetic alloys chromium-tellurium and manganese-antimony on the magnetic field"; A.K. Kikoin: "Investigation of ferromagnetic alloys chromium-tellurium" and F.S. Smirnov: "Investigation of ferromagnetic alloys chromium-sulfure".

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Reports by G.A.Smolenskiy: "Non metallic ferromagnetics" and by M.A.Grebovskiy: "Some physical properties of magnetites" dealt with physico-chemical, electrochemical and technological investigations of semiconducting ferromagnetic materials: ferrites and oxifers.

F.M.Galperin exposed his theory in "Atomic magnetic moments and the crystalline structure of ferromagnetic metals and alloys". His assumptions were sharply criticized by Ya.G.Dorfan, E.I.Vorlin and others.

F.M.Galperin and T.M.Pershalina reported on "Investigation of hydromagnetic effect in the alloy chromium-tellurium by the classical resonance method".

B.M.Fradin reported his formulas for "Computation of electromagnetic properties of magnetodielectrics, connected through an insulating medium of ferromagnetic powder".

The following reports reflected experimental and theoretical research by authors, mostly in paramagnetic resonance: B.M.Kozyrev: "Resonant paramagnetic absorption in liquid solutions". S.G.Salikhov: "Experimental investigation of resonant absorption of some paramagnetic and ferromagnetic salts". A.I. Rykhin: "Absolute measurements of paramagnetic absorption in perpendicular fields at a 10⁹ cycle frequency of an alternating acoustic field". G.Ya. Globashev: "Shape of curves of resonant paramagnetic absorption".

A.S.Bobrovik-Romanov reported on "Magnetic susceptibility of solid oxygen". The results confirmed those obtained by Landau and Pomeranchuk.

The following reports dealt with hysteresis: Prof. A.I.Yanus and V.I. Drozhzhina: "Relation between rotatory and constant field hysteresis of steel". R.S.Serapkin: "Hysteresis losses in strongly rotatory magnetic fields". M.V.Vtyurin: "Thermal dependence of losses on hysteresis in rotating magnetic fields".

V.F.Ivlev reported results of experimental work in "Effect of elastic tensions on the irreversible jumps of magnetization", and "Thermal dependence of irreversible jumps of remagnetization".

Prof. B.F.Tsomaikion and V.F.Ivlev gave a description of an original remote recording method in "Investigation methods of irreversible jumps of remagnetization".

Prof. K.M.Polivanov and V.V.Kuznetsov described their investigations in "Pulse magnetization of permanent magnets".

The following reports dealt with elastic tensions in magnetic fields. M.I.Yerevin and G.S.Krinchik: "Effect of elastic tensions on processes of shifting of boundaries of ferromagnetic domains". D.D.Mishin: "Effect of small elastic tensions on initial susceptibility of ferromagnetics". D.A.Finger: "Effect of variable load on magnetic properties of ferromagnetics".

A.A.Lukshin in: "Dependence of effect of thermomagnetic treatment on initial properties of ferromagnetics" described his investigations of alloys alsiifer and 66 permalloy.

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Ya.S.Shur and P.N.Dunayev in "Dependence of effect of thermomechanical treatment of soft magnetic materials on magnitude of load and on temperature of treatment" found the existence of a "critical" load and of an "optimal" temperature for a maximum of susceptibility.

Ye.P.Svirina described her experimental research in "Effect of degree of order on magnetic properties of highly susceptible alloys"

K.M.Bolskova reported on "Investigation of magnetization in heterogeneous and ferrous alloys under tension in strong fields"

V.V.Parfenov referred to his experimental magnetization curves in: "Investigation of magnetic susceptibility of ferromagnetics in strong magnetic fields" In a second report he discussed: "Application of electromagnets to ballistic measurements by method of switching".

Reports by prof. R.I.Yanus, V.I.Drozhdzhina and Ye.M. Shetlina: "Differential pulse measurement method by means of ballistic galvanometer" and "Hysteresis of demagnetization coefficients of ferromagnetic bars" dealt with techniques of measurements.

A. Ye. Vlasov in his reports: "Investigation of thermal dependence of magnetostriction of nickel by the method of remote photorecording" and "Effect of method of demagnetization on the magnitude of the observed magnetostriction" described results of measurements of thermal behavior of magnetostriction.

M.V.Deldiyar presented a new method for obtaining a "magnetic hysteresis loop approaching a rectangle" in samples of two-phased iron carbide.

V.V.Druzhinin described his measurements in "Anisotropy of magnetic susceptibility and coercive force in compounds of ferrosilicon."

Prof. Ye. S. Shur, V.I.Drozhdzhina and I.G.Lubinskaya reported on "Electric resistance and its variation in magnetic field of magneto alloy".

Prof. Ya.S.Shur and B.D.Zolotov reported their experimental results in "Dependence of coercive force of powders of highly coercive alloys on dimensions of particles".

D.A.Shturkin's report "Magnetostriction of highly coercive alloys" dealt with experimental research by the author of thermal dependence of curves and loops of hysteresis of magnetostriction of highly coercive materials alnico and vicalla.

Prof. Ya.S.Shur, M.A. Baranova and V.A.Zaikova reported on "Thermal magnetic hysteresis of highly coercive alloys" of alnico type, undergone various treatment.

Total research on magnetism, performed in USSR during the last years, was summarized during the session. Big scientific progress was marked, but deficiencies had also to be mentioned, because some important problems have been omitted, coordination among various experts has been lacking and the training of specialists has been found to be insufficient.

The conference laid out plans for the development of physics of magnetic phenomena for some years to come.

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